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BASAL STEM ROT OF OIL PALM : INCIDENCE, ETIOLOGY AND CONTROL

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BASAL STEM ROT OF OIL PALM : INCIDENCE, ETIOLOGY AND CONTROL

By

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Thesis Submitted in Fulfilment of the Requirements for the Degree of Master of Agricultural Science in the Faculty of Agriculture Universiti Pertanian Malaysia

July 1990

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BASAL STEM ROT OF OIL PALM :
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July 1990

Supervisor : Associate Professor Dr. Lim Tong Kwee

Faculty : Agriculture

Basal stem rot (BSR) caused by Ganoderma spp. is a disease of economic importance in oil palm in Malaysia. Although much is known on the occurrence of this devastating disease, fundamental studies on it and its pathogen are rather limited. At present, there appears to be ambiguity in the identity of the causal organisms; there is difficulty in getting oil palms to be artificially infected and that control measures advocated are largely inadequate to contain the disease. Present studies are thus focussed on answering these issues.

An assessment of the BSR situation on selected estates was also carried out to assist in the understanding of the disease.

The assessment carried out showed that serious incidence of the disease was confined to coastal and riverine estates. However, the disease can now be seen to occur in a few inland estates albeit sporadically and at very low incidence. It was demonstrated that previous crops did not necessarily dictate significant incidence of BSR. The underplanting technique and certain soil types can predispose plantings to much higher BSR incidence.

To-date, the fungus has not been cultivated successfully in the laboratory until sporophore formation. A method of cultivation has been developed where this can be achieved under controlled growing conditions. Observation of sporophores has enabled better identification of the pathogen. In that sporophores exhibited polymorphism, the colour of sporophores proved to be a reliable parameter. It has been confirmed that isolates pathogenic to oil palm were not G. lucidum. Two species have been identified in association with diseased palms. They are G. boninense and G. tornatum. An isolate from a dead coconut trunk revealed it as G. boninense while the rubber isolate is G. philippii.

When basidiospores on sporophores were viewed under the scanning electron microscope, it was evident that morphological characters were useful parameters for identification. Apart from the shape and size of basidiospores, the surface ornamentation was a useful tool for taxonomic classification. Differences among G. lucidum, G. philippii, G. boninense and G. tornatum were reinforced.

Previously, doubts have been raised on the pathogenicity of Ganoderma spp. on oil palm. The present study confirmed G. boninense to be a primary parasite. A method of obtaining 100% infection from artificial inoculation has been devised. The Koch's Postulate of duplicating symptoms on very young seedlings similar to those observed on naturally infected field palms and subsequent reisolation of the pathogen were successfully obtained.

In the study on the effects of new systemic fungicides for controlling BSR, it was found that fungicides evaluated in vitro were highly inhibitory to the pathogen. The results showed that hexaconazole, cyproconazole and triadimenol were the most inhibitory to G. boninense with ED_{50} values of 0.030, 0.043 and 0.060 ppm a.i. respectively. Propiconazole, fusilazol, carboxin, tridemorph, triadimefon and flutriafol were the next effective with ED_{50} values

within the range of 0.2 to 0.6 ppm a.i. The least inhibitory was oxycarboxin with an ED_{50} value of 11.9 ppm a.i. As for *in vivo* fungicide screening, seven fungicides tested were effective at delaying death of infected palms significantly as compared to untreated checks and those treated by surgery. They were fusilazol, hexaconazole, cyproconazole, flutriafol, triadimenol, tridemorph and oxycarboxin in descending order of efficacy.

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PENYAKIT REPUT PANGKAL BATANG PADA KELAPA SAWIT: INSIDEN, ETIOLOGI DAN KAWALANNYA

Oleh

KHAIRUDIN BIN HASHIM

Julai 1990

Penyelia : Professor Madya Dr. Lim Tong Kwee

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Penyakit reput pangkal batang yang disebabkan oleh Ganoderma spp. adalah sejenis penyakit yang penting dari segi ekonomi pada tanaman kelapa sawit di Malaysia. Sungguhpun banyak yang telah diketahui mengenai penyakit yang membinasakan ini, kajian asas tentangnya dan patogen penyebabnya adalah terhad. Pada masa kini, masih terdapat keraguan mengenai identiti organisma penyebab; kesukaran untuk mendapatkan jangkitan buatan pada kelapa sawit dan langkah-langkah pengawalan yang disyorkan kebanyakan kurang memuaskan bagi mengawal merebaknya penyakit ini. Fokus kajian-kajian kini adalah untuk mencari

jawapan bagi isu-isu yang disebutkan. Satu penilaian mengenai situasi penyakit reput pangkal batang di ladang-ladang juga dijalankan bagi membantu dalam memahami penyakit ini.

Penilaian yang dijalankan telah menunjukkan bahawa insiden penyakit adalah terbatas pada ladang-ladang yang terletak di tepi-tepi pantai dan sungai. Bagaimanapun, penyakit ini telah mula dilihat berlaku di beberapa buah ladang yang terletak di kawasan jauh dari laut tetapi insidennya adalah jarang dan rendah. Adalah didapati bahawa tanaman terdahulu tidak semestinya menyebabkan insiden penyakit yang bermakna. Kaedah penanaman semula kelapa sawit baru di bawah pohon tua dan sesetengah jenis tanah boleh mendedahkan tanaman tersebut kepada insiden penyakit reput pangkal batang yang lebih tinggi.

Sehingga kini, kulat penyebab penyakit ini belum berjaya dipelihara di dalam makmal hingga ke peringkat pembentukkan sporofor. Satu kaedah pemeliharaan telah direka di mana ini boleh dicapai di bawah keadaan pertumbuhan yang terkawal. Pengamatan ke atas sporofor-sporofor telah membolehkan pengenalpastian patogen dengan baik. Sporofor didapati mempamirkan pelbagai bentuk atau polimorfisme manakala warnanya merupakan ciri yang berguna untuk pengenalpastian. Pencilan-pencilan yang patogenik terhadap kelapa sawit telah dikenalpasti bukannya G. lucidum. Dua spesies telah dikenalpasti

berhubung-kait dengan palma berpenyakit. Mereka adalah G. boninense dan G. tornatum. Satu pencilan yang diambil dari batang kelapa yang sudah mati menunjukkan ia adalah G. boninense manakala pencilan dari getah ialah G. philippii.

Apabila basidiospora atas sporofor dilihat di bawah mikroskop elektron pengimbasan, adalah didapati sifat-sifat morfologi berguna untuk pengenalan. Selain dari bentuk dan saiz basidiospora, perhiasan permukaan adalah berguna untuk pengkelasan taksonomi. Perbezaan di antara G. lucidum, G. philippi, G. boninense dan G. tornatum diperkukuhkan.

Sebelum ini, keraguan telah dibangkitkan mengenai kepatogenan Ganoderma spp. terhadap kelapa sawit. Kajian ini telah mengesahkan bahawa G. boninense adalah parasit utama. Satu kaedah untuk mendapatkan jangkitan 100% dari inokulasi buatan telah dimajukan. Dalil Koch untuk mendapatkan simptom ke atas anak benih muda kelapa sawit seperti yang terdapat pada pohon kelapa sawit di ladang secara asli serta pengasingan semula patogen telah dilakukan dengan jayanya.

Di dalam kajian ke atas kesan racun-racun kulat sistemik yang baru bagi pengawalan penyakit, adalah didapati bahawa kesemua racun kulat adalah sungguh berkesan in vitro terhadap patogen. Keputusan

menunjukkan bahawa 'hexaconazole', 'cyproconazole', dan 'triadimenol' adalah yang paling berkesan terhadap G. boninense dengan nilai ED_{50} 0.030, 0.043 dan 0.060 bsj b.a. 'Propiconazole', 'fusilazol', 'carboxin', 'tridemorph', 'triadimefon' dan 'flutriafol' adalah juga berkesan dengan nilai ED_{50} di antara 0.2 hingga 0.6 bsj b.a. Racun kulat yang paling kurang berkesan ialah oxycarboxin dengan nilai ED_{50} 11.9 bsj b.a. Berhubung dengan saringan in vivo racun kulat, tujuh darinya didapati berkesan melengahkan kematian pohon kelapa sawit dengan bermakna berbanding dengan kawalan dan pohon-pohon sawit yang diperlakukan surgeri. Racun-racun kulat tersebut ialah 'fusilazol', 'hexaconazole', 'cyproconazole', 'flutriafol', 'triadimenol', 'tridemorph' and 'oxycarboxin' dalam susunan keberkesanan yang berkurangan.

CHAPTER I

INTRODUCTION

The oil palm (Elaeis guineensis Jacq.) is a native of West Africa and was introduced into Malaysia around 1875. The first commercial planting began in 1917 in Selangor, but it was not until the 1960s that the area began to expand rapidly (Hartley, 1977). Within the last three decades, area under oil palm has increased to 1,685,600 hectares in 1987 from about 55,000 hectares in 1960. Production of crude palm oil has also increased from around 82,000 tonnes to 4,532,000 tonnes over the same period (Malaysian Ministry of Finance, 1988). Presently, Malaysia is the leading producer of palm oil in the world, with an estimated total palm product export earnings of M$3.9 billion in 1987 (Palm Oil Registration and Licensing Authority, 1988).

Although relatively young, the oil palm industry has reflected the success of Malaysia's agricultural diversification programme to avoid over-dependance on rubber as the sole export crop. Major contributing factors for this success are: the politically stable climate for development, the extremely suitable weather with fairly uniform rainfall, the particularly suitable soils with good physical and chemical characteristics, the development of high yielding planting materials through research and development efforts, and lastly, freedom